B.E. CIVIL ENGINEERING FOURTH YEAR FIRST SEMESTER SUPPLEMENTARY EXAM 2018

Ref Ex/CE/T/412/2018(s)

Design of structures –III

Time 3 hours Full Marks 100

Use separate answer script for each part

Part – I (60 Marks)

Answer Q1 and any one from Q2 and Q3

Assume reasonable values of any data if required
IS 1893, IS1343 and IRC-6 are allowed in the examination hall
Notations have their usual meaning

Q 1 (a) A simply supported pre-stressed concrete beam of cross section 300 mm x 800 mm deep is loaded with a uniformly distributed live load of 100KN/m on a span of 10m. Obtain the distribution of stresses at mid span and at ends for the initial and final conditions. The beam is post-tensioned by 4 tendons of 250 mm^2 each. The tendons are located at 100 mm from bottom. The Initial pre-stress in the tendons is 1800 MPa. Assume 16% loss of pre-stress. **15**

(b) A G+8 storey RCC hospital building (25m x 25m in plan) is to be constructed at New Delhi. Columns are placed 5m c/c along both direction. Floor to floor height is 3.2m except ground floor which is 3.0 m for parking. The service block is separated structurally from the main building by expansion joint. Determine the design wind pressure and forces in the frame. Calculate also the bending moment and shear fore on an internal frame (with diagram) at 4th floor level only. Take the plinth level is 150 mm above ground level and top of the pile cap is 800mm below Ground level. **25**

Q 2 (a) What are the differences between Pretension and post-tension system in Pre-stressed Concrete structures? What are the different types of losses in pre-stressing ?

(b) " To find out the reaction factor for the central girder of a typical three girder R C C bridges, the live loads are positioned nearer to the kerb" – Explain

(c) What is transfer girder? Where is it used in reinforced concrete structures?

(d) Draw the long section and cross-section of a column at a typical floor of size 700 mm X 700 mm with 12 nos 25 mm dia HYSD Bars .The spacing of ties is 8 mm dia @100 c/c (near Junction and 200c/c for the rest part. The detailing should be as per IS 13920 and IS456 .Cross-section of the connecting beams is 350mm X 500mm.Floor to floor height = 3.4m. **5X4 =20**

Q3. A RCC tee beam (simply supported) bridge is to be constructed over a river . The following data is given:

- Clear width of roadways = 7.5 m
- Span of the bridge = 20 m
- Average thickness of wearing coat = 80 mm
- Thickness of deck slab = 300 mm
- Number of main girders = 3
- Number of cross girders = 6
- Spacing of the main girders = 2.9 m
- Size of kerb = 300mm (depth) X7 mm (width)

Determine the maximum bending moment for the central girder due to Class AA tracked loading only. **20**

Ref. No.: Ex/CE/T/412/2018(S)

B.E. CIVIL ENGINEERING

FOURTH YEAR-FIRST SEMESTER-SUPPLEMENTARY EXAM 2018

Design of Structures III

Time – 3hours

Full marks – 100

Figures in the margin indicates marks

Part –II

(40 marks)

Assume reasonable values of any data , If required

20

1. Design the stem and check the stability of a Cantilever type RCC Retaining wall of height 5.5m to retain a soil of its full height and a surcharged load of 20 KN/m^2. Safe bearing capacity of soil = 170 KN/m^2 . $¥_s$ = 16 KN/m^3 and $\emptyset = 29^0$. Grade of concrete M20. Grade of steel Fe 415. Apply LSM as per IS 456. Show detail of reinforcements through neat sketches.

Or

20

2. Design the stem and check the stability of a Cantilever type RCC Retaining wall of height 6.5m to retain a soil of its full height and a surcharged load of 22 KN/m^2. Safe bearing capacity of soil = 190 KN/m^2 . $¥_s$ = 17 KN/m^3 and $\emptyset = 32^0$. Grade of concrete M20. Grade of steel Fe 415. Apply LSM as per IS 456. Show detail of reinforcements through neat sketches.

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3. Design a RCC pile cap against an axial compressive force of P=3200KN and biaxial moments M_x =180 KN-m and M_y = 150 KN-m , under (D+S) condition. Column size – 500x500. Use 500mm dia . cast in situ piles of capacity of 900KN. Grade of concrete M20. Grade of steel Fe 415. Apply LSM as per IS 456. Show detail of reinforcements through neat sketches.

Or

20

4. Design a RCC pile cap against an axial compressive force of P=3500KN and biaxial moments M_x =170 KN-m and M_y = 140 KN-m , under (D+S) condition. Column size – 600x600. Use 500mm dia . cast in situ piles of capacity of 1000KN. Grade of concrete M20. Grade of steel Fe 415. Apply LSM as per IS 456. Show detail of reinforcements through neat sketches.